

REFERENCES

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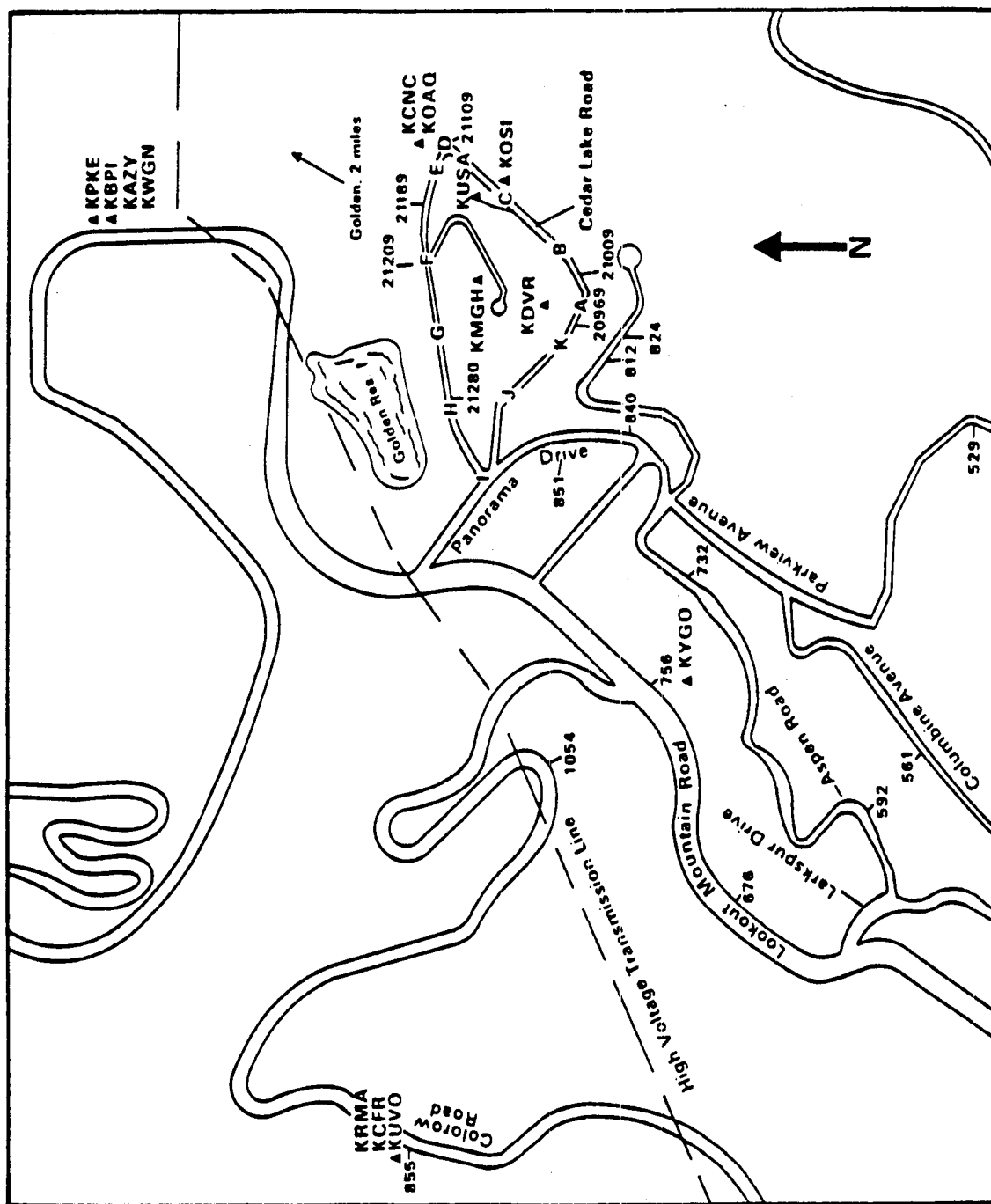


Figure 1. Map of Lookout Mountain

TABLE 1. Lookout Mountain Broadcasters, Grouped by Tower

<u>Location of Tower</u>	<u>Call Sign</u>	<u>Frequency (MHz)</u>
Lookout Mountain Road	KWGN-TV	57.5
	KBPI-FM	105.9
	KAZY-FM	106.7
Lookout Mountain Road	KPKE-FM	95.7
Colorow Road	KRMA-TV	85.5
	KCFR-FM	90.1
	KUVO-FM	89.3
Cedar Lake Road	KUSA-TV	189.5
Cedar Lake Road	KCNC-TV	69.5
	KOAQ-FM	103.5
Cedar Lake Road	KOSI-FM	101.1
Cedar Lake Road	KMGH-TV	177.5
Cedar Lake Road	KDVR-TV	575.5
Lookout Mountain Road	KYGO-FM	98.5

TABLE 2. Data Collected at Top of Access Road
to Lookout Mountain Transmitters

<u>Antenna</u>	<u>File Name</u>	<u>Frequency Range</u>	<u>Power Density</u> <u>($\mu\text{W}/\text{cm}^2$)</u>
FOISD	I26M57	AM Radio	0.0000874
FOISD	I26N09	Low VHF TV	0.601
FOISD	ZOIZMs	Low VHF TV	0.941
FOISD	I26N14	FM Radio	6.87
FOISD	ZOIZMs	FM Radio	8.66
FOISD	I26N47	Land Mobile VHF (peak)	0.0435
FOISD	I26N19	High VHF TV	0.946
FOISD	ZOIZMs	High VHF TV	1.66
FOISD	I26N31	Land Mobile UHF (peak)	0.462
FOISD	ZOIZMs	UHF Channel 31	1.01
FOISD	I26N24	UHF Channel 31	0.603
OMNI	I26006	UHF Channel 31	0.940
OMNI	I26014	Two-Way Radio (peak)	0.0539
OMNI	*	5.57 GHz Radar (peak)	11.4

*The data for radar were collected by reading directly from the screen of the spectrum analyzer as the antenna was positioned in three orthogonal orientations. These data were not processed by the computer and therefore have no file name.

TABLE 3. Power Densities ($\mu\text{W}/\text{cm}^2$) Determined with Narrowband and Broadband Instruments

<u>Location*</u>	<u>File Name</u>	<u>Category 1, 55 MHz to 578 MHz</u>		
		<u>FOISD</u>	<u>Holaday S/N 26046 up to 6000 MHz</u>	<u>Holaday S/N 26038 up to 6000 MHz</u> <u>Holaday S/N 26042 up to 6000 MHz</u>
A. Near KDVR	ZOIVRU	17.1	12.8	13.9
B. South of KOSI	ZOINK2	46.5	30.6	22.3
C. Near KOSI	ZOINLU	159	167	170
D. Near 21109 Cedar Lake Rd.	ZOINPF	75.6	68.3	65.6
E. 60 ft. east of 21189 Cedar Lake Rd.	ZOIMQZ	48.5	40.6	44.6
later at same location	ZOIMRC	48.3		
F. Near 21209 Cedar Lake Rd.	ZOIMRV	22.5	18.5	20.2
Near KYGO transmitter building not at maximum E-field	ZOIXJN	1242	1072	976
				1004
				17.4
				37.2

*See Figure 1 for locations of the measurement sites.

TABLE 3. Power Densities ($\mu\text{W}/\text{cm}^2$) Determined with Narrowband and Broadband Instruments (continued)

<u>Location*</u>	<u>File Name</u>	<u>Category 2, Below 200 MHz</u>				<u>Category 3, above 300 MHz</u>
		<u>FOISD</u>	<u>IFI up to 200 MHz</u>	<u>Narda 8631 H Probe up to 300 MHz</u>	<u>Narda 8662 E Probe up to 300 MHz</u>	
A. Near KDVR	ZOIVRU	6.59		could not zero	noise level	10.5
B. South of KOSI	ZOIKK2	7.13	resonance problems	negative zero drift	could not zero	39.4
C. Near KOSI	ZOIKLU	153	202	157	197	5.24
D. Near 21109 Cedar Lake Rd.	ZOIKPF	75.1	88.9	42.8 at 2' above ground 55.1 at 7.5' above ground	89.6	0.456
E. 60 ft. east of 21189 Cedar Lake Rd.	ZOIKQZ	46.3	55.2	33.3	44.8	2.22
Later at same location	ZOIKRC	46.1				2.23
F. Near 21209 Cedar Lake Rd.	ZOIKRV	21.7	49.2	could not zero	26.9	0.855
Near KYGO transmitter building not at maximum E-field	ZOIKJN	1242	1487		1299	0.186

*See Figure 1 for locations of the measurement sites.

TABLE 5.

Approximate Greatest Distance and Magnetic Bearing from
the Base of KYGO Tower to $1000 \mu\text{W}/\text{cm}^2$ Power Density

<u>Distance (feet)</u>	<u>Bearing</u>
27	336°
28	312°
31	212°
32	196°
33	184°
37	148°
39	145°
36	87°
30	80°
27	12°

Approximate Greatest Distance and Magnetic Bearing from Base
of KYGO Tower to $200 \mu\text{W}/\text{cm}^2$ Power Density

<u>Distance (feet)</u>	<u>Bearing</u>
51	12°
70	144°
74	156°
89 (near guy wire pole)	158°
57	190°
53	210°
42	256°
50	326°

TABLE 6. Residential Power Densities

<u>Location</u>	<u>FOISD Value/File Name</u>	<u>Holaday Serial Number</u>	<u>Holaday Value ($\mu\text{W}/\text{cm}^2$)</u>
21109 Cedar Lake Road	58.9/ZOIYN8		
21280 Cedar Lake Road deck, yard generally deck, yard maximum trampoline spring surface, maximum	10.9/ZOIYOU	26046	7.07-11.8 23.6 200.0
21009 Cedar Lake Road in front of garage, generally on steps on steps, maximum porch and yard porch and yard maximum	19.4/ZOIYOf	26046	23.6 11.8-18.8 23.6 4.71-16.5 23.6
20969 Cedar Lake Road yard and driveway yard and drive maximum inside house inside house maximum deck maximum	7.91/ZOIYQo	26042	5.0-17.4 24.8 5.0-24.8 49.6 24.8
851 Panorama Drive front yard deck backyard	4.49/ZOIYOy	26046	2.36-4.71 4.71-14.1 2.36-11.8
840 Panorama Drive in front of house inside house upper deck, rear lower deck, rear next to metal lounge, maximum	5.81/ZOIYPF	26042	0-3.7 0-2.5 1.2-5.0 0-5.0 9.9
732 Aspen Road driveway front porch	5.53/ZOIYPR	26042	0-7.4 0-5.0
676 Lookout Mountain Road driveway near garage upper deck near metal furniture, maximum	11.6/ZOIYP1	26046	1.2-3.5 11.8-47.1 589

TABLE 6. Residential Power Densities (cont.)

<u>Locations</u>	<u>FOISD Value/File Name</u>	<u>Holaday Serial Number</u>	<u>Holaday Value ($\mu\text{W}/\text{cm}^2$)</u>
561 Columbine Avenue	5.61/ZOIYPt	26042	
driveway			0.5-11.2
back porch			1.2-9.9
S.E. corner of house			12.4
back yard			1.2-16.1
front porch, away from KYGO			1.2-6.2
529 Parkview Avenue	7.88/ZOIYP2	26046	
driveway			1.2-4.7
near wood fence			4.7-9.4
front deck and back yard			2.4-4.7
near metal furniture, maximum			47.1
812 Aspen Road	4.57/ZOIYQT	26042	
road above house			1.2-9.9
drive and parking area			0-3.7
deck and stairs			0-3.7
side of house			1.2-7.4
front of house			0-2.5
592 Aspen Road	24.0/ZOIYPe		
824 Aspen Road	8.14/ZOIYQe		
756 Lookout Mountain Road	37.2/ZOIZIu		
1054 Colorow Road	55.8/ZOIYQx		
Across road from 756 Lookout Mountain Road	85.8/ZOIZJD		
Genesee, end of 700 block of Chimney Creek	0.237/ZOIYRS (Lookout Mountain Stations) 0.00015 ZOIYRq (Mount Morrison FM Stations)		

APPENDIX A
ZOOM Data Files

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVD	89.3	-43.34	-35.75	-36.04	-31.45	36.45	112.00	.042
KCFR	90.1	-32.96	-28.95	-30.70	-25.80	36.45	117.65	.154
KPKE	95.7	-52.81	-37.46	-48.26	-37.00	36.45	106.45	.011
KYGO	98.5	-17.34	-13.73	-15.75	-10.58	36.45	132.87	5.131
KOSI	101.1	-26.51	-28.37	-41.79	-24.25	36.45	119.20	.220
KOAQ	103.5	-39.15	-36.89	-44.10	-34.38	36.45	109.07	.021
KBPI	105.9	-42.45	-33.32	-42.28	-32.35	36.45	111.10	.034
KAZY	106.7	-42.95	-36.03	-30.48	-29.22	36.45	114.23	.070

Total Power Density: 5.684

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-39.25	-44.73	-47.07	-37.64	36.45	101.81	.004
KCNC	67.24	-35.04	-36.68	-38.19	-31.68	36.45	107.77	.015
KRMA	83.24	-22.40	-27.68	-32.01	-20.92	36.45	118.53	.189
KMGH	175.25	-24.82	-23.33	-19.63	-17.25	36.45	122.20	.440
KUSA	187.24	-40.96	-34.80	-35.38	-31.54	36.45	107.91	.016
KDVR	573.25	-11.25	-9.97	-10.22	-5.67	37.61	134.93	8.259

Total Power Density: 8.924

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-47.50	-45.73	-51.44	-42.87	36.45	100.58	.002
KCNC	71.74	-43.67	-45.67	-45.29	-40.02	36.45	103.43	.005
KRMA	87.74	-43.27	-35.18	-40.70	-33.61	36.45	109.84	.025
KMGH	179.75	-28.38	-32.19	-28.87	-24.75	36.45	118.70	.196
KUSA	191.74	-43.54	-43.46	-43.00	-38.56	36.45	104.89	.008
KDVR	577.75	-18.87	-28.66	-18.56	-15.49	37.67	129.19	2.195

Total Power Density: 2.435

TV & FM Power Density: 17.050

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-59.37	-58.50	-54.23	-51.98	50.40	105.42	.009
KCFR	90.1	-54.39	-54.73	-51.25	-48.39	50.40	109.01	.021
KPKE	95.7	-42.86	-42.33	-43.38	-38.06	50.40	119.34	.227
KYGO	98.5	-45.10	-56.64	-54.41	-44.35	50.40	113.05	.053
KOSI	101.1	-18.57	-19.99	-11.06	-9.90	50.40	147.50	149.049
KOAQ	103.5	-46.43	-53.37	-45.36	-42.48	50.40	114.92	.082
KBPI	105.9	-39.93	-38.38	-44.17	-35.45	50.40	121.95	.415
KAZY	106.7	-40.97	-42.68	-46.77	-38.10	50.40	119.30	.225

Total Power Density: 150.104

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-42.70	-48.46	-42.38	-39.00	50.40	114.40	.072
KCNC	67.24	-41.36	-43.55	-40.44	-36.83	50.40	116.57	.120
KRMA	83.24	-46.19	-51.54	-48.21	-43.36	50.40	110.04	.026
KMGH	175.25	-33.83	-31.80	-46.89	-29.61	50.40	123.79	.635
KUSA	187.24	-28.65	-32.37	-37.60	-26.74	50.40	126.66	1.228
DVR	573.25	-24.61	-36.86	-25.75	-21.99	51.56	132.57	4.792

Total Power Density: 6.876

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-57.30	-51.12	-53.13	-48.40	50.40	109.00	.021
KCNC	71.74	-49.75	-59.87	-49.76	-46.54	50.40	110.86	.032
KRMA	87.74	-60.14	-61.26	-62.04	-56.30	50.40	101.10	.003
KMGH	179.75	-36.58	-43.78	-42.92	-35.05	50.40	122.35	.455
KUSA	191.74	-35.38	-51.77	-36.55	-32.86	50.40	124.54	.754
DVR	577.75	-39.30	-49.21	-39.78	-36.30	51.62	122.33	.453

Total Power Density: 1.720

TV & FM Power Density: 158.702

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVD	89.3	-53.64	-47.53	-47.28	-43.90	36.45	99.55	.002
KCFR	90.1	-54.69	-49.23	-42.43	-41.40	36.45	102.05	.004
KPKE	95.7	-23.54	-26.42	-26.60	-20.51	36.45	122.94	.522
KYGO	98.5	-40.63	-41.82	-48.23	-37.77	36.45	105.68	.009
KOSI	101.1	-10.87	-3.03	-13.95	-2.08	36.45	141.37	36.487
KDAG	103.5	-34.79	-19.76	-27.97	-19.03	36.45	124.47	.733
KEPI	105.9	-19.35	-23.66	-29.99	-17.72	36.45	125.73	.993
KAZY	106.7	-17.22	-29.78	-28.73	-16.70	36.45	126.75	1.253
Total Power Density:								39.906

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-36.90	-36.44	-39.95	-32.74	36.45	106.71	.012
KCNC	67.24	-31.75	-26.67	-31.15	-24.45	36.45	115.00	.083
KRMA	83.24	-38.53	-38.37	-36.58	-32.96	36.45	106.49	.033
KMGH	175.25	-27.90	-27.69	-27.16	-22.80	36.45	116.65	.122
KUSA	187.24	-4.54	-5.02	-2.73	.79	36.45	140.24	28.036
KDVR	573.25	-25.90	-23.57	-24.22	-19.69	37.61	120.92	.327
Total Power Density:								28.594

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-34.89	-41.89	-47.48	-33.90	36.45	109.55	.023
KCNC	71.74	-36.03	-33.31	-29.16	-27.15	36.45	116.30	.113
KRMA	87.74	-49.34	-43.58	-45.23	-40.68	36.45	102.77	.005
KMGH	179.75	-32.65	-32.86	-32.30	-27.83	36.45	115.62	.096
KUSA	191.74	-13.31	-12.43	-19.68	-9.41	36.45	134.04	6.726
KDVR	577.75	-40.22	-29.26	-34.39	-27.84	37.67	116.84	.125
Total Power Density:								7.092

TV & FM Power Density: 75.594

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
- KUVD	89.3	-50.44	-47.31	-40.25	-39.14	36.45	104.31	.007
- KCFR	90.1	-38.11	-37.61	-37.06	-32.80	36.45	110.65	.030
- KPKE	95.7	-18.12	-17.36	-24.91	-14.32	36.45	129.13	2.172
- KYGO	98.5	-39.22	-41.94	-50.29	-37.14	36.45	106.31	.011
- KOSI	101.1	-21.11	-18.72	-21.62	-15.52	36.45	127.93	1.647
- KDAQ	103.5	-30.90	-28.08	-22.51	-20.98	36.45	122.47	.468
- KRPI	105.9	-22.91	-17.86	-24.36	-15.99	36.45	127.46	1.476
- KAZY	106.7	-25.39	-23.24	-27.15	-20.20	36.45	123.25	.561

Total Power Density: 6.375

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
- KWGN	55.25	-34.80	-32.44	-28.01	-26.05	36.45	113.40	.058
- KCNC	67.24	-25.17	-29.10	-27.82	-22.27	36.45	117.18	.138
- KRMA	83.24	-40.67	-39.39	-37.59	-34.26	36.45	105.19	.008
- KMGH	175.25	-29.68	-20.20	-19.07	-16.38	36.45	123.07	.537
- KUSA	187.24	-1.89	-4.58	-6.78	.81	36.45	140.26	28.169
- KDVR	573.25	-20.56	-15.68	-17.99	-12.86	37.61	127.74	1.577

Total Power Density: 30.490

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
- KWGN	59.75	-35.02	-35.04	-45.41	-31.83	36.45	111.62	.038
- KCNC	71.74	-38.35	-53.97	-32.87	-31.76	36.45	111.69	.039
- KRMA	87.74	-51.20	-48.20	-45.54	-42.95	36.45	100.50	.002
- KMGH	179.75	-31.72	-25.31	-21.87	-19.95	36.45	123.50	.594
- KUSA	191.74	-10.58	-16.93	-11.89	-7.63	36.45	135.82	10.125
- KDVR	577.75	-28.72	-23.81	-25.47	-20.79	37.67	123.89	.649

Total Power Density: 11.449

TV & FM Power Density: 48.314

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVD	89.3	-49.66	-47.95	-39.96	-38.94	36.45	104.51	.007
KCFR	90.1	-39.05	-37.64	-36.92	-33.01	36.45	110.44	.029
KPKE	95.7	-17.64	-17.95	-25.14	-14.40	36.45	129.05	2.131
KYGO	98.5	-39.08	-42.67	-49.24	-37.22	36.45	106.23	.011
KOSI	101.1	-20.48	-18.90	-21.96	-15.50	36.45	127.95	1.655
KOAQ	103.5	-33.48	-26.91	-22.47	-20.89	36.45	122.56	.478
KBPI	105.9	-22.48	-18.53	-23.16	-16.11	36.45	127.34	1.438
KAZY	106.7	-25.22	-24.03	-26.03	-20.24	36.45	123.21	.555
Total Power Density:								6.307

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-35.10	-31.61	-28.53	-26.19	36.45	113.26	.056
KCNC	67.24	-24.88	-28.89	-28.27	-22.20	36.45	117.25	.140
KRMA	83.24	-40.86	-39.84	-36.95	-34.12	36.45	105.33	.009
KMGH	175.25	-28.35	-20.04	-19.36	-16.39	36.45	123.06	.536
KUSA	187.24	-1.75	-5.19	-6.30	.81	36.45	140.26	28.171
KDVR	573.25	-20.14	-15.31	-18.81	-12.82	37.61	127.79	1.594
Total Power Density:								30.509

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-34.48	-35.38	-48.17	-31.80	36.45	111.65	.038
KCNC	71.74	-38.46	-57.18	-33.23	-32.08	36.45	111.37	.036
KRMA	87.74	-50.90	-48.77	-44.65	-42.54	36.45	100.91	.003
KMGH	179.75	-31.39	-25.87	-21.80	-20.03	36.45	123.42	.582
KUSA	191.74	-10.81	-17.21	-11.25	-7.52	36.45	135.93	10.389
KDVR	577.75	-27.77	-23.57	-26.82	-20.89	37.67	123.78	.633
Total Power Density:								11.684

TV & FM Power Density: 48.500

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-36.63	-35.42	-36.53	-31.39	36.45	112.06	.0428
KCFR	90.1	-34.95	-31.79	-30.32	-27.19	36.45	116.26	.1121
KPKE	95.7	-17.02	-24.27	-22.65	-15.37	36.45	128.08	1.7044
KYGO	98.5	-37.47	-34.53	-34.36	-30.47	36.45	112.98	.0527
KOSI	101.1	-32.83	-39.60	-36.16	-30.59	36.45	112.86	.0512
KOAQ	103.5	-26.14	-28.30	-25.76	-21.83	36.45	121.62	.3854
KBPI	105.9	-21.26	-17.22	-23.34	-15.07	36.45	128.38	1.8248
KAZY	106.7	-22.24	-26.13	-28.55	-20.09	36.45	123.36	.5755

Total Power Density:

4.7486

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-33.59	-26.74	-29.24	-24.26	36.45	115.19	.0875
KCNC	67.24	-30.92	-27.18	-23.20	-21.24	36.45	118.21	.1755
KRMA	83.24	-24.12	-26.41	-25.60	-20.50	36.45	118.95	.2082
KMGH	175.25	-7.23	-12.12	-9.65	-4.45	36.45	135.00	8.3899
KUSA	187.24	-19.72	-27.84	-16.01	-14.27	36.45	125.18	.8233
KDVR	573.25	-20.88	-19.48	-30.11	-16.90	37.61	123.71	.6227

Total Power Density:

10.3573

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-40.87	-40.00	-38.62	-34.96	36.45	108.49	.0187
KCNC	71.74	-38.10	-45.44	-38.27	-34.78	36.45	108.67	.0195
KRMA	87.74	-34.52	-41.02	-30.57	-28.83	36.45	114.62	.0768
KMGH	179.75	-13.39	-13.61	-16.47	-9.51	36.45	133.94	6.5693
KUSA	191.74	-23.79	-50.04	-24.94	-21.31	36.45	122.14	.4340
KDVR	577.75	-28.32	-32.61	-30.17	-25.25	37.67	119.42	.2320

Total Power Density:

7.3505

TV & FM Power Density:

22.4567

TABLE 3. Power Densities ($\mu\text{W}/\text{cm}^2$) Determined with Narrowband and Broadband Instruments

<u>Location*</u>	<u>File Name</u>	<u>Category 1, 55 MHz to 578 MHz</u>		
		<u>FOISD</u>	<u>Holaday S/N 26046 up to 6000 MHz</u>	<u>Holaday S/N 26038 up to 6000 MHz</u>
A. Near KDVR	ZOIVRU	17.1	12.8	13.9
B. South of KOSI	ZOIKK2	46.5	30.6	22.3
C. Near KOSI	ZOIKLU	159	167	170
D. Near 21109 Cedar Lake Rd.	ZOIKPF	75.6	68.3	65.6
E. 60 ft. east of 21189 Cedar Lake Rd.	ZOIKQZ	48.5	40.6	44.6
later at same location	ZOIMRC	48.3		
F. Near 21209 Cedar Lake Rd.	ZOIMRV	22.5	18.5	20.2
Near KYGO transmitter building not at maximum E-field	ZOIXJN	1242	1072	976
				1004
				17.4
				37.2
				159
				69.4

*See Figure 1 for locations of the measurement sites.

TABLE 4. Averaged Power Density in $\mu\text{W}/\text{cm}^2$
along Segments of Cedar Lake Road

<u>Segment*</u>	<u>Minimum</u>	<u>Average</u>	<u>Maximum</u>
A to B	0.515	11.1	35.6
B to C	1.15	34.4	181.0
C to D	5.51	86.6	505.0
D to E	0.791	15.7	80.4
E to F	0.773	11.3	30.3
F to G	0	6.48	25.0
G to H	0.036	4.18	10.8
H to I	0	2.12	9.13
I to J	0	3.82	13.3
J to K	0.293	7.19	35.1
K to A	0.577	7.54	21.3

*See Figure 1 for the locations of the segments

TABLE 5.

Approximate Greatest Distance and Magnetic Bearing from
the Base of KYGO Tower to $1000 \mu\text{W}/\text{cm}^2$ Power Density

<u>Distance (feet)</u>	<u>Bearing</u>
27	336°
28	312°
31	212°
32	196°
33	184°
37	148°
39	145°
36	87°
30	80°
27	12°

Approximate Greatest Distance and Magnetic Bearing from Base
of KYGO Tower to $200 \mu\text{W}/\text{cm}^2$ Power Density

<u>Distance (feet)</u>	<u>Bearing</u>
51	12°
70	144°
74	156°
89 (near guy wire pole)	158°
57	190°
53	210°
42	256°
50	326°

TABLE 6. Residential Power Densities (cont.)

<u>Locations</u>	<u>FOISD Value/File Name</u>	<u>Holaday Serial Number</u>	<u>Holaday Value ($\mu\text{W}/\text{cm}^2$)</u>
561 Columbine Avenue	5.61/ZOIYPt	26042	
driveway			0.5-11.2
back porch			1.2-9.9
S.E. corner of house			12.4
back yard			1.2-16.1
front porch, away from KYGO			1.2-6.2
529 Parkview Avenue	7.88/ZOIYP2	26046	
driveway			1.2-4.7
near wood fence			4.7-9.4
front deck and back yard			2.4-4.7
near metal furniture, maximum			47.1
812 Aspen Road	4.57/ZOIYQT	26042	
road above house			1.2-9.9
drive and parking area			0-3.7
deck and stairs			0-3.7
side of house			1.2-7.4
front of house			0-2.5
592 Aspen Road	24.0/ZOIYPe		
824 Aspen Road	8.14/ZOIYQe		
756 Lookout Mountain Road	37.2/ZOIZIu		
1054 Colorow Road	55.8/ZOIYQx		
Across road from 756 Lookout Mountain Road	85.8/ZOIZJD		
Genesee, end of 700 block of Chimney Creek	0.237/ZOIYRS (Lookout Mountain Stations) 0.00015 ZOIRq (Mount Morrison FM Stations)		

APPENDIX A
ZOOM Data Files

TABLE 6. Residential Power Densities

<u>Location</u>	<u>FOISD Value/File Name</u>	<u>Holaday Serial Number</u>	<u>Holaday Value ($\mu\text{W}/\text{cm}^2$)</u>
21109 Cedar Lake Road	58.9/ZOIYN8		
21280 Cedar Lake Road deck, yard generally deck, yard maximum trampoline spring surface, maximum	10.9/ZOIYOU	26046	7.07-11.8 23.6 200.0
21009 Cedar Lake Road in front of garage, generally on steps on steps, maximum porch and yard porch and yard maximum	19.4/ZOIYOf	26046	23.6 11.8-18.8 23.6 4.71-16.5 23.6
20969 Cedar Lake Road yard and driveway yard and drive maximum inside house inside house maximum deck maximum	7.91/ZOIY0o	26042	5.0-17.4 24.8 5.0-24.8 49.6 24.8
851 Panorama Drive front yard deck backyard	4.49/ZOIYOy	26046	2.36-4.71 4.71-14.1 2.36-11.8
840 Panorama Drive in front of house inside house upper deck, rear lower deck, rear next to metal lounge, maximum	5.81/ZOIYPF	26042	0-3.7 0-2.5 1.2-5.0 0-5.0 9.9
732 Aspen Road driveway front proch	5.53/ZOIYPR	26042	0-7.4 0-5.0
676 Lookout Mountain Road driveway near garage upper deck near metal furniture, maximum	11.6/ZOIYP1	26046	1.2-3.5 11.8-47.1 589

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVD	89.3	-43.34	-33.75	-36.04	-31.45	36.45	112.00	.04
KCFR	90.1	-32.96	-28.95	-30.70	-25.80	36.45	117.65	.15
KPKE	95.7	-52.81	-37.46	-48.26	-37.00	36.45	106.45	.01
KYGO	98.5	-17.34	-13.73	-15.75	-10.58	36.45	132.87	5.57
KOSI	101.1	-26.51	-28.37	-41.79	-24.25	36.45	119.20	.24
KDAQ	103.5	-39.15	-36.89	-44.10	-34.38	36.45	109.07	.02
KBPI	105.9	-42.45	-33.32	-42.28	-32.35	36.45	111.10	.01
KAZY	106.7	-42.95	-36.03	-30.48	-29.22	36.45	114.23	.05

Total Power Density: 5.68

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-39.25	-44.73	-47.07	-37.64	36.45	101.81	.00
KCNC	67.24	-35.04	-36.68	-38.19	-31.68	36.45	107.77	.01
KRMA	83.24	-22.40	-27.68	-32.01	-20.92	36.45	118.53	.18
KMGH	175.25	-24.82	-23.33	-19.63	-17.25	36.45	122.20	.44
KUSA	187.24	-40.96	-34.80	-35.38	-31.54	36.45	107.91	.01
KDVR	573.25	-11.25	-9.97	-10.22	-5.67	37.61	134.93	8.25

Total Power Density: 8.92

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-47.50	-45.73	-51.44	-42.87	36.45	100.58	.00
KCNC	71.74	-43.67	-45.67	-45.29	-40.02	36.45	103.43	.00
KRMA	87.74	-43.27	-35.18	-40.70	-33.61	36.45	109.84	.02
KMGH	179.75	-28.38	-32.19	-28.87	-24.75	36.45	118.70	.19
KUSA	191.74	-43.54	-43.46	-43.00	-38.56	36.45	104.89	.00
KDVR	577.75	-18.87	-28.66	-18.56	-15.49	37.67	129.19	2.19

Total Power Density: 2.43

TV & FM Power Density: 17.05

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-59.37	-58.50	-54.23	-51.98	50.40	105.42	.001
KCFR	90.1	-54.39	-54.73	-51.25	-48.39	50.40	109.01	.021
KPKE	95.7	-42.86	-42.33	-43.38	-38.06	50.40	119.34	.221
KYGO	98.5	-45.10	-56.64	-54.41	-44.35	50.40	113.05	.057
KOSI	101.1	-18.57	-19.99	-11.06	-9.90	50.40	147.50	149.06
KOAR	103.5	-46.43	-53.37	-45.36	-42.48	50.40	114.92	.082
KBPI	105.9	-39.93	-38.38	-44.17	-35.45	50.40	121.95	.411
KAZY	106.7	-40.97	-42.68	-46.77	-38.10	50.40	119.30	.225

Total Power Density: 150.104

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-42.70	-48.46	-42.38	-39.00	50.40	114.40	.072
KCNC	67.24	-41.36	-43.55	-40.44	-36.83	50.40	116.57	.120
KRMA	83.24	-46.19	-51.54	-48.21	-43.36	50.40	110.04	.026
KMGH	175.25	-33.83	-31.80	-46.89	-29.61	50.40	123.79	.635
KUSA	187.24	-28.65	-32.37	-37.60	-26.74	50.40	126.66	1.228
KDVR	573.25	-24.61	-36.86	-25.75	-21.99	51.56	132.57	4.792

Total Power Density: 6.876

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-57.30	-51.12	-53.13	-48.40	50.40	109.00	.021
KCNC	71.74	-49.75	-59.87	-49.76	-46.54	50.40	110.86	.032
KRMA	87.74	-60.14	-61.26	-62.04	-56.30	50.40	101.10	.003
KMGH	179.75	-36.58	-43.78	-42.92	-35.05	50.40	122.35	.455
KUSA	191.74	-35.38	-51.77	-36.55	-32.86	50.40	124.54	.754
KDVR	577.75	-39.30	-49.21	-39.78	-36.30	51.62	122.33	.453

Total Power Density: 1.7208

TV & FM Power Density: 158.702

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dRuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-53.64	-47.53	-47.28	-43.90	36.45	99.55	0.0
KCFR	90.1	-54.69	-49.23	-42.43	-41.40	36.45	102.05	0.0
KPKE	95.7	-23.54	-26.42	-26.60	-20.51	36.45	122.94	0.0
KYGO	98.5	-40.63	-41.82	-48.23	-37.77	36.45	105.68	0.0
KOSI	101.1	-10.87	-3.03	-13.95	-2.08	36.45	141.37	36.3
KDAG	103.5	-34.79	-19.76	-27.97	-19.03	36.45	124.42	2.7
KBPI	105.9	-19.35	-23.66	-29.99	-17.72	36.45	125.73	2.8
KAZY	106.7	-17.22	-29.78	-28.73	-16.70	36.45	126.75	1.2
Total Power Density:								39.9

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dRuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-36.90	-36.44	-39.95	-32.74	36.45	106.71	0.0
KCNC	67.24	-31.75	-26.67	-31.15	-24.45	36.45	115.00	0.0
KRMA	83.24	-38.53	-38.37	-36.58	-32.96	36.45	106.49	0.0
KMGH	175.25	-27.90	-27.69	-27.16	-22.80	36.45	116.65	1.2
KUSA	187.24	-4.54	-5.02	-2.73	.79	36.45	140.24	28.0
KDVR	573.25	-25.90	-23.57	-24.22	-19.69	37.61	120.92	3.1
Total Power Density:								28.5*

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dRuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-34.89	-41.89	-47.48	-33.90	36.45	109.55	0.0
KCNC	71.74	-36.03	-33.31	-29.16	-27.15	36.45	116.30	1.1
KRMA	87.74	-49.34	-43.58	-45.23	-40.68	36.45	102.77	0.0
KMGH	179.75	-32.65	-32.86	-32.30	-27.83	36.45	115.62	0.0
KUSA	191.74	-13.31	-12.43	-19.68	-9.41	36.45	134.04	6.7
KDVR	577.75	-40.22	-29.26	-34.39	-27.84	37.67	116.84	1.2
Total Power Density:								7.0*

TV & FM Power Density: 75.5*

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBrV/m)	Power Density (uW/cm ²)
KUVO	89.3	-50.44	-47.31	-40.25	-39.14	36.45	104.31	.007
KCFR	90.1	-38.11	-37.61	-37.06	-32.80	36.45	110.65	.03
KPKE	95.7	-18.12	-17.36	-24.91	-14.32	36.45	129.13	2.127
KYGO	98.5	-39.22	-41.94	-50.29	-37.14	36.45	108.31	.03
KOSI	101.1	-21.11	-18.72	-21.62	-15.52	36.45	127.93	1.647
KOAQ	103.5	-30.90	-28.08	-22.51	-20.98	36.45	122.47	.468
KEPI	105.9	-22.91	-17.86	-24.36	-15.99	36.45	127.46	1.428
KAZY	106.7	-25.39	-23.24	-27.15	-20.20	36.45	123.25	.562
Total Power Density:								6.325

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBrV/m)	Power Density (uW/cm ²)
KWGN	55.25	-34.80	-32.44	-28.01	-26.05	36.45	113.40	.058
KCNC	67.24	-25.17	-29.10	-27.82	-22.27	36.45	117.18	.138
KRMA	83.24	-40.67	-39.39	-37.59	-34.26	36.45	105.19	.008
KMGH	175.25	-29.68	-20.20	-19.07	-16.38	36.45	123.07	.537
KUSA	187.24	-1.89	-4.58	-6.78	.81	36.45	140.26	28.169
KDVR	573.25	-20.56	-15.68	-17.99	-12.86	37.61	127.74	1.577
Total Power Density:								30.490

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBrV/m)	Power Density (uW/cm ²)
KWGN	59.75	-35.02	-35.04	-45.41	-31.83	36.45	111.62	.038
KCNC	71.74	-38.35	-53.97	-32.87	-31.76	36.45	111.69	.039
KRMA	87.74	-51.20	-48.20	-45.54	-42.95	36.45	100.50	.002
KMGH	179.75	-31.72	-25.31	-21.87	-19.95	36.45	123.50	.594
KUSA	191.74	-10.58	-16.93	-11.89	-7.63	36.45	135.82	10.125
KDVR	577.75	-28.72	-23.81	-25.47	-20.79	37.67	123.89	.649
Total Power Density:								11.449

TV & FM Power Density: 48.314

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-49.66	-47.95	-39.96	-38.94	36.45	104.51	.0
KCFR	90.1	-39.05	-37.64	-36.92	-33.01	36.45	110.44	.0
KPKE	95.7	-17.64	-17.95	-25.14	-14.40	36.45	129.05	2.1
KYGO	98.5	-39.08	-42.67	-49.24	-37.22	36.45	106.23	.0
KOSI	101.1	-20.48	-18.90	-21.96	-15.50	36.45	127.95	1.6
KOAG	103.5	-33.48	-26.91	-22.47	-20.89	36.45	122.56	.4
KBPI	105.9	-22.48	-18.53	-23.16	-16.11	36.45	127.34	1.4
KAZY	106.7	-25.22	-24.03	-26.03	-20.24	36.45	123.21	.5

Total Power Density: 6.30

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-35.10	-31.61	-28.53	-26.19	36.45	113.26	.05
KCNC	67.24	-24.88	-28.89	-28.27	-22.20	36.45	117.25	.14
KRMA	83.24	-40.86	-39.84	-36.95	-34.12	36.45	105.33	.01
KMGH	175.25	-28.35	-20.04	-19.36	-16.39	36.45	123.06	.53
KUSA	187.24	-1.75	-5.19	-6.30	.81	36.45	140.26	28.12
KDVR	573.25	-20.14	-15.31	-18.81	-12.82	37.61	127.79	1.55

Total Power Density: 30.50

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBm)	Pz (dBm)	Total Power (dBm)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-34.48	-35.38	-48.17	-31.80	36.45	111.65	.03
KCNC	71.74	-38.46	-57.18	-33.23	-32.08	36.45	111.37	.01
KRMA	87.74	-50.90	-48.77	-44.65	-42.54	36.45	100.91	.00
KMGH	179.75	-31.39	-25.87	-21.80	-20.03	36.45	123.42	.58
KUSA	191.74	-10.81	-17.21	-11.25	-7.52	36.45	135.93	10.30
KDVR	577.75	-27.77	-23.57	-26.82	-20.89	37.67	123.78	.61

Total Power Density: 11.68

TV & FM Power Density: 48.50

FM Radio Station Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KUVO	89.3	-36.63	-35.42	-36.53	-31.39	36.45	112.06	.045
KCFR	90.1	-34.95	-31.79	-30.32	-27.19	36.45	116.26	.112
KPKE	95.7	-17.02	-24.27	-22.65	-15.37	36.45	128.08	1.704
KYGO	98.5	-37.47	-34.53	-34.36	-30.47	36.45	112.98	.052
KOSI	101.1	-32.83	-39.60	-36.16	-30.59	36.45	112.86	.051
KOAQ	103.5	-26.14	-28.30	-25.76	-21.83	36.45	121.62	.385
KBPI	105.9	-21.26	-17.22	-23.34	-15.07	36.45	128.38	1.824
KAZY	106.7	-22.24	-26.13	-28.55	-20.09	36.45	123.36	.575

Total Power Density: 4.748

TV Video Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	55.25	-33.59	-26.74	-29.24	-24.26	36.45	115.19	.0871
KCNC	67.24	-30.92	-27.18	-23.20	-21.24	36.45	118.21	.1755
KRMA	83.24	-24.12	-26.41	-25.60	-20.50	36.45	118.95	.2087
KMGH	175.25	-7.23	-12.12	-9.65	-4.45	36.45	135.00	8.3899
KUSA	187.24	-19.72	-27.84	-16.01	-14.27	36.45	125.18	.8737
KDVR	573.25	-20.88	-19.48	-30.11	-16.90	37.61	123.71	.6227

Total Power Density: 10.3573

* 4 dB subtracted from peak electric field to obtain RMS electric field

TV Audio Measurements

Call Sign	Frequency (MHz)	Px (dbm)	Py (dBrn)	Pz (dBrn)	Total Power (dBrn)	Antenna Factor (dB)	Electric Field (dBuV/m)	Power Density (uW/cm ²)
KWGN	59.75	-40.87	-40.00	-38.62	-34.96	36.45	108.49	.0182
KCNC	71.74	-38.10	-45.44	-38.27	-34.78	36.45	108.67	.0195
KRMA	87.74	-34.52	-41.02	-30.57	-28.83	36.45	114.62	.0268
KMGH	179.75	-13.39	-13.61	-16.47	-9.51	36.45	133.94	6.5693
KUSA	191.74	-23.79	-50.04	-24.94	-21.31	36.45	122.14	.4340
KDVR	577.75	-28.32	-32.61	-30.17	-25.25	37.67	119.42	.2320

Total Power Density: 7.3505

TV & FM Power Density: 22.4567

* Finally it is interesting to note the effect of different elevations (in mountainous areas) on the power densities and records. Another narrowband FOISD measurement (file ZOIZIU) made on top of the vehicle in the parking lot at 756 Lookout Mountain Road, in the property on which the KYGO antenna is located, found a power density of $37.2 \mu\text{W}/\text{cm}^2$. This measurement location was perhaps 100 feet from the KYGO tower and below the center of radiation. The elevation increases as one moves across Lookout Mountain Road, approaching the apparent height of the center of radiation of the KYGO antenna. Another FOISD measurement (file ZOIZJD) was made at this higher, but more distant location (perhaps 200 to 300 feet from KYGO). Usually, tripling the distance from an antenna in this way would reduce the power density by a factor of 9. In this case however, the effect of greater distance was overcome by moving higher into the main beam of radiation. The power density rose to $85.8 \mu\text{W}/\text{cm}^2$ in the driveway of a home across Lookout Mountain Road from KYGO. Even at 1054 Colorow Road, approximately 800 feet from KYGO but still elevated with respect to the base of the KYGO tower, the power density remains greater than in the parking lot at 756 Lookout Mountain Road. The power density measured near 1054 Colorow Road was $55.8 \mu\text{W}/\text{cm}^2$ (file ZOIQX). These data illustrate the need to consider the relative elevations of areas surrounding a station in the overall RF exposure evaluation.

Measurements Near Other Lookout Mountain Towers:

Approximately three quarters of a mile from the Lookout Mountain antenna farm are two towers which support a variety of communications antennas, two FM antennas, and one VHF-TV antenna. KRMA-TV, KCFR-FM, and KUVU-FM are located at the Colorow Hill site. Electric field measurements were made at this site using two Holaday meters (S/N 26046, 26042). At the base of the broadcast tower the power densities ranged from 2 to $124 \mu\text{W}/\text{cm}^2$. Between the antennas and Colorow Road power densities of 350 to $425 \mu\text{W}/\text{cm}^2$ were found. Across the road values up to $200 \mu\text{W}/\text{cm}^2$ were found.

These data prompted the team to search for the $200 \mu\text{W}/\text{cm}^2$ contour along Colorow Road. Power densities up to $200 \mu\text{W}/\text{cm}^2$ were found along a 125 foot length of Colorow Road, centered approximately at the door to the transmitter building. The $200 \mu\text{W}/\text{cm}^2$ levels extended to about 12 feet beyond the far side of Colorow Road from the transmitter building. A FOISD narrowband measurement, made near the antennas reported a power density of $204 \mu\text{W}/\text{cm}^2$. This file, identified as ZOIZMF, found the major contributor to be KCFR-FM. KUVU-FM and KRMA-TV were the next strongest contributors but together provided only about half the power density of KCFR at that location.

At another location, one third of a mile north of the Lookout Mountain antenna farm, is a smaller group of towers supporting antennas for TV and FM stations. A survey near these towers using the Holaday (S/N 26042) found locations where the power densities reached $273 \mu\text{W}/\text{cm}^2$. However, power densities were usually below $200 \mu\text{W}/\text{cm}^2$, and over the entire area the levels were generally between 50 and $100 \mu\text{W}/\text{cm}^2$, well below the FCC guidelines.

Community Measurements

* The purpose of studies like this one is to evaluate the extent of human exposure to RF radiation. This was a concern of many Lookout Mountain

residents who attended an informal gathering with the EPA and FCC investigators on the evening of September 24. At that meeting, EPA agreed to make limited measurements at several homes in the area. These measurements included collection of narrowband FOISD data at each location and broadband survey data at several homes. For these measurements the FOISD was positioned on top of the vehicle, and the vehicle moved to an arbitrary point along the road or in the driveway. Because these locations were arbitrarily chosen, the FOISD power densities probably are neither maxima nor minima, but are useful because they indicate the major source(s) of the RF radiation at each location. Another measurement a few feet away would probably find a different absolute power density. The broadband data were collected with two Holadays. Table 6 presents all these data.

* None of the power densities in Table 6 exceeds the FCC guideline. With only two exceptions, none of the values exceeds even the most stringent RF radiation safety guideline being considered in the United States. The two exceptions, a $200 \mu\text{W}/\text{cm}^2$ power density near a trampoline spring and a $589 \mu\text{W}/\text{cm}^2$ power density near a piece of metal furniture, are more representative of the concentrating effect metal objects have on electric field lines than they are representative of typical power densities. Electric field intensity can be dramatically increased near conductive objects, particularly if those objects have sharp corners. This is why lightning preferentially strikes lightning rods. However, the presence of another conductive object, such as a human, can further alter the electric field, generally lowering the intensity near pointed conductive objects. Because of this, the importance of high measured electric field intensities near conductive objects is controversial. Traditional thinking on this subject is that relatively high, localized fields, near conductive objects where the surrounding field is substantially less, do not cause energy absorption rates in tissue that would normally be associated with whole-body exposures to fields of the same high values.

* In order to place these values into perspective, two measurements were made in an area that is relatively distant from the Lookout Mountain antennas. At the end of the 700 block of Chimney Creek Road in the Genesee residential area, power densities from Lookout Mountain broadcasters and from Mount Morrison broadcasters (located near Genesee) were measured with the FOISD. At this location, the power density from Lookout Mountain broadcast sources was $0.2 \mu\text{W}/\text{cm}^2$ and that from the Mount Morrison FM broadcasters was $0.00015 \mu\text{W}/\text{cm}^2$. These values can be compared with the $0.005 \mu\text{W}/\text{cm}^2$ median level to which the populations of 15 major U.S. cities are exposed (6).

Holaday (S/N 26046) measurements were also made at the Buffalo Bill grave tourist attraction. At the overlook near the visitor center, the highest value found was about $2 \mu\text{W}/\text{cm}^2$. At the grave itself, power densities up to $8 \mu\text{W}/\text{cm}^2$ were measured. Typical values ranged from about 5 to $14 \mu\text{W}/\text{cm}^2$ at the overlook near the grave.

DISCUSSION

The height and topographic location of the KYGO antenna make it a convenient "field laboratory" to illustrate two characteristics of FM signals. The KYGO antenna is unusually low on its tower causing excessive

* power densities directly below the elements. This is the "grating lobe" which points directly down to the ground and straight up into the air from the elements. Because the antenna is so low to the ground, moving a short distance away from the tower base places one at a large angle away from vertical with respect to the elements. The 10,000 $\mu\text{W}/\text{cm}^2$ value found at the base of the tower decreases rapidly as one moves away from the base of the tower and out of the grating lobe. The power density falls to 1000 $\mu\text{W}/\text{cm}^2$ at about 30 feet, and to 200 $\mu\text{W}/\text{cm}^2$ by 50 to 70 feet from the tower. The second point illustrated by KYGO is that in a mountainous area, one cannot rely on such a rapid reduction in power density with distance because the measurement locations may be moving up into the main-beam of radiation. Additional data collected near KYGO actually show an increasing power density with distance from the antenna as the measurement location moves closer to the main beam of radiation. RF hazard investigators should be aware of this property not only in mountainous terrain but also in urban environments where the main beam of radiation may be intercepted by nearby tall buildings.

A surprising finding in Table 3 is that the Holaday electric field meter reported values that were below the actual (FOISD) value. While the Holaday data in Table 3 are not far from the FOISD data, the Holaday values are almost always low. The authors' experience, however, is that diode detectors, such as the Holaday, tend to overrespond rather than underrespond in complex RF environments. Because of this, diode detectors have been considered conservative. However, the authors' judgement in this case is that the value reported by the FOISD represented the maximum field in an area with no nearby perturbations, while the Holaday values were collected in the presence of a 6 foot tall individual, the surveyor, within a few feet of the probe. It is likely that the presence of the person would lower the field at the probe, particularly when the probe is at the location of the maximum field value in the area, thereby causing the discrepancy. Additional comparison measurements in other complex environments will help resolve the issue. The IFI meter's erratic response at location B and the Narda system's zero drift problems further underscore the fact that no single meter is adequate for all monitoring situations.

It is worthy of note that the maximum value measured at the base of the KYGO tower compares closely with that predicted by an EPA program designed for this purpose. The program calculated a maximum power density of 9,620 $\mu\text{W}/\text{cm}^2$. The maximum values measured with electric and magnetic field meters were 10,350 $\mu\text{W}/\text{cm}^2$ and 9,500 $\mu\text{W}/\text{cm}^2$ respectively for a maximum difference between theory and data of about 0.3 dB. A similar comparison between predicted and measured values in an earlier study in Oregon, also found approximately 0.3 dB difference. This correspondence is encouraging because it helps EPA and FCC decide which antennas are likely to produce ground-level power densities that exceed the FCC guidelines. Output from this modeling technique could be used to identify areas of potentially high public exposures and to select additional areas for field study. The application of the model to other FM facilities has shown that power densities as great as that predicted at KYGO are unusual but not unique.

CONCLUSIONS

- * 1. Near the base of the KYGO-FM tower power densities reach 10,000 $\mu\text{W}/\text{cm}^2$ in a publicly accessible area. This far exceeds the FCC 1,000 $\mu\text{W}/\text{cm}^2$ guideline (2) for FM frequencies. The KYGO tower is located in a complex of buildings where some people live throughout the year and where seasonal residential workshops are held to teach square dancing. EPA urges the FCC to order KYGO to correct these extreme values in publicly accessible areas as soon as possible. The few measurements made inside the main building of the compound found no power densities exceeding 100 $\mu\text{W}/\text{cm}^2$.
2. The maximum power density near the KOSI-FM tower, 580 $\mu\text{W}/\text{cm}^2$, is below the FCC guideline, however the spatially averaged power density within an area of about 1,000 square feet near the tower exceeds the 200 $\mu\text{W}/\text{cm}^2$ NCRP (4) and IRPA (5) standards and two of the options that EPA (3) is considering for RF radiation protection guidance.
3. With the exception of the area near the base of the KOSI tower, none of the averaged power density data collected around the Cedar Lake Road circle exceeds any recommendation that has been adopted or is being considered by major organizations within the United States.
4. Typical power densities at several residences on Lookout Mountain did not exceed 100 $\mu\text{W}/\text{cm}^2$, the most stringent value that exists (7) or is being considered in the United States although higher power densities of limited extent can be found, particularly near field-enhancing, metal objects. At a location more distant from the Lookout Mountain antennas, a power density of 0.2 $\mu\text{W}/\text{cm}^2$ was measured in the Genesee residential area.
5. TV and FM antennas on Colorow Road produce power densities that exceed 200 $\mu\text{W}/\text{cm}^2$ along a 125 foot length of Colorow Road. However, the maximum value found near the Colorow Hill antennas did not exceed the FCC guideline.
6. The maximum power density measured at the TV and FM towers along Lookout Mountain Road (one third mile north of the Cedar Lake Road area) was 273 $\mu\text{W}/\text{cm}^2$. However, power densities were typically between 50 $\mu\text{W}/\text{cm}^2$ and 100 $\mu\text{W}/\text{cm}^2$ in this nonresidential area.

REFERENCES

1. ANSI C95.1-1982 Safety Levels with respect to Human Exposure to Radio Frequency Electromagnetic Fields, 300 kHz to 100 GHz, American National Standards Institute. Available from the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017.
2. Consideration of Biological Effects of Radiofrequency Radiation and the Potential Effects of a Reduction in the Allowable Level of Radiofrequency Radiation; Report and Order, Federal Communications Commission; Federal Register, Vol. 50, No. 54, Wednesday, March 20, 1985; p. 11151.
3. Federal Radiation Protection Guidance; Proposed Alternatives for Controlling Public Exposure to Radiofrequency Radiation, Notice of Proposed Recommendations; Environmental Protection Agency; Federal Register, Vol. 51, No. 146, Wednesday, July 30, 1986; p. 27318.
4. Biological Effects and Exposure Criteria for Radiofrequency Electromagnetic Fields, National Council on Radiation Protection and Measurements, Report No. 86, Bethesda, Maryland, 1986.
5. Interim Guidelines on Limits of Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 100 kHz to 300 GHz. International Non-Ionizing Radiation Committee of the International Radiation Protection Association. Health Physics Vol. 46, No. 4 (April), pp. 975-984, 1984.
6. Tell, R. A., and E. D. Mantipty, "Population Exposure to VHF and UHF Broadcast Radiation in the United States." Proceedings of the IEEE, Vol. 68, No. 1, January 1980.
7. Portland Planning Commission 1980 Interim Radiofrequency Emissions Standard.

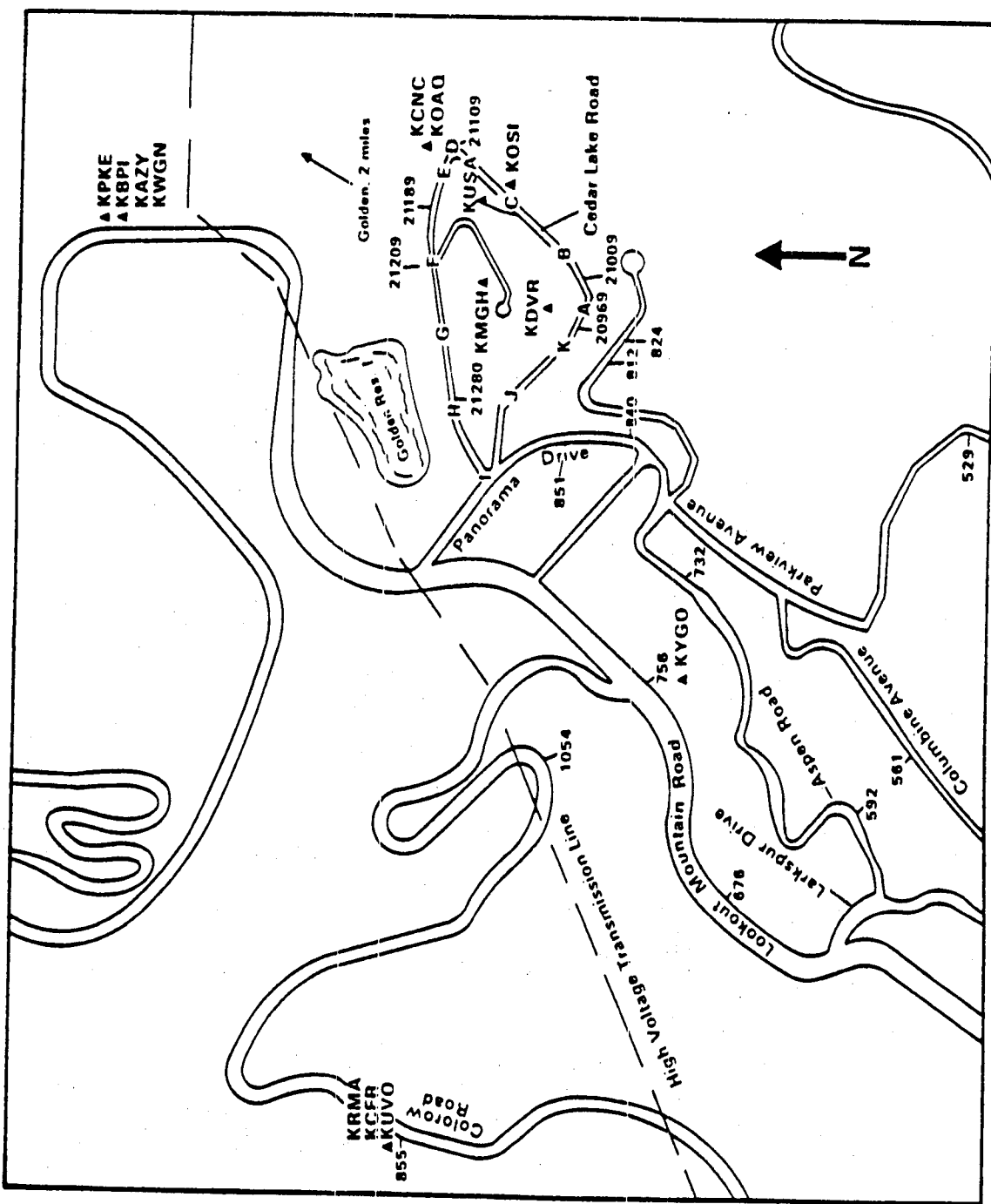


Figure 1. Map of Lookout Mountain

TABLE 1. Lookout Mountain Broadcasters, Grouped by Tower

<u>Location of Tower</u>	<u>Call Sign</u>	<u>Frequency (MHz)</u>
Lookout Mountain Road	KWGN-TV	57.5
	KBPI-FM	105.9
	KAZY-FM	106.7
Lookout Mountain Road	KPKE-FM	95.7
Colorow Road	KRMA-TV	85.5
	KCFR-FM	90.1
	KUVO-FM	89.3
Cedar Lake Road	KUSA-TV	189.5
Cedar Lake Road	KCNC-TV	69.5
	KOAQ-FM	103.5
Cedar Lake Road	KOSI-FM	101.1
Cedar Lake Road	KMGH-TV	177.5
Cedar Lake Road	KDVR-TV	575.5
Lookout Mountain Road	KYGO-FM	98.5

TABLE 2. Data Collected at Top of Access Road
to Lookout Mountain Transmitters

<u>Antenna</u>	<u>File Name</u>	<u>Frequency Range</u>	<u>Power Density</u> <u>($\mu\text{W}/\text{cm}^2$)</u>
FOISD	I26M57	AM Radio	0.0000874
FOISD	I26N09	Low VHF TV	0.601
FOISD	Z0IZMs	Low VHF TV	0.941
FOISD	I26N14	FM Radio	6.87
FOISD	Z0IZMs	FM Radio	8.66
FOISD	I26N47	Land Mobile VHF (peak)	0.0435
FOISD	I26N19	High VHF TV	0.946
FOISD	Z0IZMs	High VHF TV	1.66
FOISD	I26N31	Land Mobile UHF (peak)	0.462
FOISD	Z0IZMs	UHF Channel 31	1.01
FOISD	I26N24	UHF Channel 31	0.603
OMNI	I26006	UHF Channel 31	0.940
OMNI	I26014	Two-Way Radio (peak)	0.0539
OMNI	*	5.57 GHz Radar (peak)	11.4

*The data for radar were collected by reading directly from the screen of the spectrum analyzer as the antenna was positioned in three orthogonal orientations. These data were not processed by the computer and therefore have no file name.

It was moved by Commissioner EIKNER that the following Resolution be adopted:

BEFORE THE PLANNING COMMISSION

COUNTY OF JEFFERSON

STATE OF COLORADO

RESOLUTION

RE: Amendments to the Jefferson County Telecommunications Land Use Plan

WHEREAS, the Jefferson County Telecommunications Land Use Plan has been in effect since 1985 without revisions; and,

WHEREAS, it is the opinion of this Planning Commission that changes in technology warrant updating the Plan; and,

WHEREAS, it is in the best interest of the County, potential applicants, and other involved parties to update and clarify certain policies of the Plan; and,

WHEREAS, numerous public hearings were held before the Planning Commission concerning revisions to the Plan; and,

WHEREAS, based on the evidence, testimony, exhibits and recommendations of the Jefferson County Planning Department, comments of public officials, agencies and citizens of the County and comments from other interested parties, the Planning Commission finds as follows:

1. That proper publication and public notice has been provided for the hearings before the Planning Commission.
2. That the hearings before this Planning Commission have been extensive and complete and that all pertinent facts, matters and issues have been submitted and considered, and all interested parties heard.
3. That the revisions to the Telecommunications Land Use Plan, as amended herein, adequately address the problems and concerns raised in the public hearing by interested parties.
4. That it is the opinion of the Commission that the Jefferson County Telecommunications Land Use Plan should be revised in accordance with the draft dated December 1, 1992, except as conditioned herein.
5. That said Plan revisions are in the best interest of the health, safety, welfare and morals of the citizens of Jefferson County.

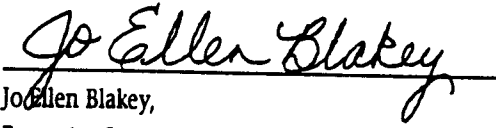
NOW, THEREFORE, BE IT RESOLVED that the Jefferson County Telecommunications Land Use Plan be revised, as delineated by the above resolution with exceptions as noted herein be and hereby is APPROVED; and adopted as a component of the Jefferson County Comprehensive Plan pursuant to Section 30-28-108, C.R.S., and that said approved Jefferson County Telecommunications Land Use Plan be certified to the Board of County Commissioners pursuant to 30-28-109 C.R.S. as amended.

Conditions:

1. In Tower Siting Policies, policy A.2., change the word 'should' to 'must'.
2. In Tower Siting Policies, policy B.3.b., revise to read: "Buildings or other structures that have an adverse visual impact AND THAT ARE LOCATED WITHIN THE VICINITY OF A PROPOSED TOWER . . ."

Commissioner KRAPES seconded the adoption of the foregoing Resolution, and upon a vote of the Planning Commission the Resolution was adopted by unanimous vote of the Planning Commission of the County of Jefferson, State of Colorado.

I, JO ELLEN BLAKEY, Executive Secretary Pro-tem of the Jefferson County Planning Commission do hereby certify that the foregoing is a true copy of a Resolution duly adopted by the Jefferson County Planning Commission at a regular hearing held in Jefferson County, Colorado, on January 20, 1993.


Jo Ellen Blakey,
Executive Secretary Pro tem

It was moved by Commissioner NICOL that the following Resolution be adopted:

BEFORE THE PLANNING COMMISSION

COUNTY OF JEFFERSON

STATE OF COLORADO

RESOLUTION

RE: ADOPTION OF LOW POWER MOBILE RADIO SERVICE TELECOMMUNICATIONS LAND USE PLAN ADDENDUM

WHEREAS, on May 8, 1985, the Jefferson County Planning Commission approved and adopted the Jefferson County Telecommunications Land Use Plan as a component of the Jefferson County Comprehensive Plan; and

WHEREAS, on January 20, 1992, the Jefferson County Planning Commission approved and adopted amendments to the Jefferson County Telecommunications Land Use Plan; and

WHEREAS, on September 22, 1993, the Jefferson County Planning Commission approved an Interim Cellular Telecommunications Land Use Plan as an Addendum to the Telecommunications Land Use Plan which established policies and recommendations for cellular and cellular-like developments; and

WHEREAS, in accordance with the Jefferson County Planning Commission direction, the Jefferson County Planning staff reviewed said Interim Addendum to the Telecommunications Land Use Plan and presented recommended changes to the Planning Commission to bring it into harmony with the amended regulations adopted by the Board of County Commissioners; and

WHEREAS, the Jefferson County Planning Department has completed extensive research, analysis, review and community meetings on said Addendum and has proposed revisions to said Addendum and proposed renaming the Addendum the Low Power Mobile Radio Service Telecommunications Land Use Plan Addendum ("Addendum"); and

WHEREAS, public hearings on the proposed Addendum were held by the Jefferson County Planning Commission on October 5, 1994 and October 12, 1994, at which time this matter was continued for decision on October 19, 1994; and

WHEREAS, based on the evidence, testimony, exhibits and recommendations of the Jefferson County Planning Department, comments of public officials, agencies, and citizens of the County and comments from other interested parties, the Planning Commission finds as follows:

1. That adequate publication of public notice has been provided for hearings before the Planning Commission.
2. That the hearings before the Planning Commission have been extensive and complete and that all pertinent facts, matters, and issues have been submitted and considered, and all interested parties heard.
3. That the proposed Addendum, as amended and set forth in Exhibit "A" which is attached hereto and incorporated herein by this reference, adequately address the problems and concerns raised in the public hearings by interested parties.
4. That it is the opinion of the Planning Commission that the Low Power Mobile Radio Service Telecommunications Land Use Plan Addendum, as set forth on attached Exhibit "A" should be accepted.
5. That said Addendum, as set forth in Exhibit "A", is in the best interest of the health, safety, welfare and morals of the citizens of Jefferson County.

NOW, THEREFORE, BE IT RESOLVED that the Low Power Mobile Radio Service Telecommunications Land Use Plan Addendum, as set forth on Exhibit "A" attached hereto and incorporated herein as Exhibit "A", be and hereby is APPROVED and adopted, effective immediately, as an Addendum to the Jefferson County Telecommunications Land Use Plan and as a component of the Jefferson County Comprehensive Plan pursuant to Section 30-28-108, C.R.S., and that said approved Addendum to the Jefferson County Telecommunications Land Use Plan be certified to the Board of County Commissioners pursuant to Section 30-28-109, C.R.S., as amended.


BE IT FURTHER RESOLVED that the Interim Cellular Telecommunications Land Use Plan adopted by the Planning Commission on September 22, 1993 be and hereby is rescinded as a component of the Jefferson County Comprehensive Plan.

BE IT FURTHER RESOLVED that the Jefferson County Telecommunications Land Use Plan with the Addendum is adopted as a Jefferson County Special Plan. Said Plan and Addendum, as set forth in Exhibit "A", shall be applied in conjunction with the Jefferson County General Land Use Plan and other applicable Jefferson County Special Plans in effect. Where conflicts arise between the plans, any applicable Special Plans and Community Plans shall be given equal weight and conflicts in recommendations shall be resolved on a case by case basis. The Jefferson County Special Plans currently include the Mineral Extraction Policy Plan, Sanitary Landfill Plan, Telecommunications Plan with the Low Power Mobile Radio Service Addendum, the Major Thoroughfare Plan and the Jefferson County Open Space Plan.

BE IT FURTHER RESOLVED that the Planning Department shall review all rezoning applications not yet decided by the Board of County Commissioners for compliance with all applicable adopted components of the Jefferson County Comprehensive Plan, including the Low Power Mobile Radio Service Telecommunications Land use Plan Addendum, when applicable.

The resolution was adopted by a unanimous vote of the Planning Commission of the County of Jefferson, State of Colorado.

I, LISA J. VERNON, Executive Secretary of the Jefferson County Planning Commission do hereby certify that the foregoing is a true copy of a Resolution duly adopted by the Jefferson County Planning Commission at a regular hearing held in Jefferson County, Colorado, on October 19, 1994.


Lisa J. Vernon,
Executive Secretary

Appendix Q

FCC Broadcast Permits Issued for Lookout Mountain

FCC BROADCAST PERMITS ISSUED FOR LOOKOUT MOUNTAIN

I. SINCE CARE FILED PETITION TO FCC TO STOP RELICENSING AND ISSUING NEW LICENSES ON LOOKOUT (FCC still has matter under consideration) MARCH 1998 the FCC has granted the following:

Channel 2 Towers

1. 4/7/98- Tower Permits for 2 Channel 2 towers

Note that Channel 2 puts the following on it's application despite it's close location to Buffalo Bill's Grave and the National Historic Protection Act requirements:

"The existing facilities are not located near any known districts, sites, buildings, structures, or objects significant in American history, architecture, archaeology, engineering , or culture."

KWGN-TV	2	A0051934	1044149	4/7/98
KWGN-TV	2	A0051935	1044150	4/7/98

Channel 4

1. Channel 4 Digital-Supertower

12/2/98- FCC grants KCNC application BPCDT 1980729KJ-Digital Channel 35 (minor) change 041332

ERP-490 kw for antenna structure 1058328

Channel 6

1. 3/26/98-FCC Grants KRMA BRET 19971201KT for facility 14040

2. 7/30/98-FCC grants KUVO application BRED 19961126YX for facility 16687

3. 1/7/99-FCC grants KRMA BPET 1990107 KE for facility 14040-This is a second 100kw antenna for Channel 6-where is Misl. Permit from Jeffco ?

4. 2/4/99 Supertower--Construction Permit BPEDT-981023KH Channel 18-Digital for Channel 6Effective radiated power 1000 kw

Must notify Health Care facilities of potential interference

5. 4/21/99-KCFR application file # 1990126W7 granted. By FCC

6. 7/26/99Channel 6 aux. antenna-Channel 6 9908380MS1 KRMA Auxiliary Antenna application to replace low frequency microwave antenna with same type antenna-proposed aux.antenna 338.8 watts7/26/99-Jeffco Misl Permit 9908380MS 1 to Channel 6

Application to replace low frequency microwave antenna with same type of antenna

Channel 7

1. 4/30/98- FCC grants KMGH application BRCT 19971125KK

2. 12/2/98- FCC grants KMGH application BPCDT 19980731KI for DT 070746

This permit expired 11/1/99

Conditions

1. Notify health care facilities (lengthy)

Channel 7 Application for Digital on Supertower-Arthur Goodkind 070630

Channel 17-25 kW 070633

(Sounds like FCC would let them go up to 1000 kW) 070645

Channel 9

Sometime in 1999 Channel 9 Channel 16-Supertower FCC granted ERP: 290.000 kW

FOX

5/20/98 FCC grants KDVR application BRCT 19971201KK for facility 126

12/2/98-FCC grants FOX permit for digital at 223 kW.

310733

The DIGITAL TV antenna was turned on Nov. 1, 99 at 223 thousand watts but now the FCC has approved FOX to take their digital ERP up to 1 million watts even though their RF measurements were done with a meter way out of calibration.

Channel 20 on Supertower

?/?/98-FCC grants Channel 20 Proposed Analog for Lookout ERP: 5000.000 kW (5 million watts)

?/?/98-FCC grants digital ERP: 655.000 kW (655,000 watts)

II. SINCE JEFFERSON COUNTY COMMISSIONERS DENIED SUPERTOWER July 13, 99, the FCC has granted the following permits

Channel 2 Tower-unable to determine date of following grants but the FCC has approved the following:

1. Channel 2-Digital for Channel 2=Channel 34 ERP: 1000.000 kW,
Channel 2 has advised Jeffco that they want to add this much power
10/28/99-Channel 2 FCC application for Channel 34 Digital no copy given Jeffco
2. CH. 36 -3/1/99- Channel 36 TV Broadcast Station Construction Permit BPTT-Jgo601ZG granted to Entravision Holdings-1 kW Say no antenna structure registration!(Note-Channel K43DK will be changed to Channel 36 and located with digital channel 35 per Denver LPTV Plan)-no notice to Jeffco
3. K43DK ERP:30.300 kW-Currently permitted by FCC-don't know date-no notice to Jeffco
4. K57BT ERP 4.9 kW-Currently permitted by FCC-don't know date of FCC grant-no notice to Jeffco
5. Channel 50 Digital 10/26/99-Channel 51 KCEC-DTV Application to FCC for Construction Permit for Digital Channel 51 on tower 1044149 200 kW
"Will not have a significant environmental impact"
As of 2/14/00 the FCC records show the has FCC granted this application-no notice to Jeffco

Channel 4 Tower

1. Channel 4 TV-

9/30/99 Channel 4 Application to FCC for extension of time to construct digital. Pursuing all available legal remedies with due diligence including Aug. 12, 99 appeal of County Commissioner's denial of LCG rezoning (IF IN SUCH A RUSH FOR LEGAL RULING, WHY HAS LCG DELAYED PAYING FOR TRANSCRIPT CAUSING 2 MONTH DELAY IN JEFFCO DIST. CT CASE MOVING FORWARD?-Deb notes)
FCC granted but do not know date of FCC grant

1/27/2000- Application to Jeffco for Digital on Channel 4 S. microwave tower 990 watts

NOTE; only FCC permit on record is for 490,000 watts

Channel 6 Tower

1. 2/17/2000 FCC web site database KCFR has a blocked application- BLOCKED AUDIO FACILITIES-CHANGE APPLICATIONS AS OF [02/15/2000]

* NEXT TO CALL SIGN INDICATES AMENDMENT FILED-not sure what this is,

Channel 7 Tower

9/20/99- FCC grants KMGH analog application BLCT 19970805KM-License to cover

Channel 9 Tower

Applied to Jeffco for digital on radar tower but only FCC records show grant for supertower
Sometime in 1999 Channel 9 Digital is Channel 16 ERP: 290.000 kW

FOX Tower

10/29/99-FOX application to FCC increase ERP to Digital antenna-1000 kW ERP 310739

11/1/99-FOX digital turned on

FCC gives FOX digital permit for 223 kW 310730

2000-FCC has granted FOX application to increase to 1000kW-Jeffco not told

Channel 20-Twenver

At the time of the hearings, the FCC had granted a permit for 655 kW for the digital but the present FCC records now show that the FCC has permits for Channel 20 for both 655kW and 1000 kW on the Supertower. Channel 20 's attorney is Mr. Hummers who seems to becoming the spokesman for Lake Cedar Group.

Digital is Channel 19KTVD-DT ERP: 1000.000 kW (1 million watts)

Also shows permit for digital for ERP: 655.000 kW (655,000 watts)

TABLE 3. Power Densities ($\mu\text{W}/\text{cm}^2$) Determined with Narrowband and Broadband Instruments (continued)

<u>Location*</u>	<u>File Name</u>	<u>Category 2, Below 200 MHz</u>				<u>Category 3, above 300 MHz</u>
		<u>FOISD</u>	<u>IFI up to 200 MHz</u>	<u>Narda 8631 H Probe up to 300 MHz</u>	<u>Narda 8662 E Probe up to 300 MHz</u>	
A. Near KQVR	ZOIVRU	6.59		could not zero	noise level	10.5
B. South of KOSI	ZOIKW2	7.13	resonance problems	negative zero drift	could not zero	39.4
C. Near KOSI	ZOIMLU	153	202	157	197	5.24
D. Near 21109 Cedar Lake Rd.	ZOIMPF	75.1	88.9	42.8 at 2' above ground 55.1 at 7.5' above ground	89.6	0.456
E. 60 ft. east of 21189 Cedar Lake Rd.	ZOIMQZ	46.3	55.2	33.3	44.8	2.22
Later at same location	ZOIMRC	46.1				2.23
F. Near 21209 Cedar Lake Rd.	ZOIMRV	21.7	49.2	could not zero	26.9	0.855
Near KYGO transmitter building not at maximum E-field	ZOIXJN	1242	1487		1299	0.186

*See Figure 1 for locations of the measurement sites.

Appendix G

**Letter from University of Colorado Health Sciences
Center Department of Radiation Oncology opposing
the tower**

Department of Radiation Oncology

Campus Box A031
4200 East Ninth Avenue
Denver, Colorado 80262
(303) 372-6060
Fax: (303) 372-6071

March 3, 1999

County Commissioners:
Michele Lawrence
Pat Halloway
Richard Sheehan

Jefferson County Building
100 Jefferson County Parkway
Golden, CO 80401-3550

Dear Commissioners:

We are cancer clinicians, researchers and nurses writing in opposition to the proposed transmission tower on Lookout Mountain by the Lake Cedar Group LLC.

The planned tower will deliver doses of electro-magnetic radiation to the surrounding population higher than any similar sight in the United States. This "highest dose" region includes an elementary school and a large number of children living in the area. We know of no other instance where a device, chemical or drug, much less a non-essential TV tower, would be imposed on the public without proof of its safety. In our opinion, the medical literature on the effects of electro-magnetic radiation on human health are very difficult to interpret. There are many variables and inadequate statistics. The majority of the cancers that are in question have unknown causes and genetic input that are as yet poorly understood. We know that primary brain tumors are becoming more common but have no idea as to the reasons. Increasing exposure to electro-magnetic radiation has been proposed as a possible causative agent.

The children in the surrounding schools should not be treated as lab mice while we collect data on their health. Without proper scientific data, we consider it unconscionable to expose the people of Jefferson County to these levels of radiation. There is no proof that these towers will be medically safe and therefore they should be located in an unpopulated region.

Sincerely,

Michael D. Weil
Michael D. Weil, MD
Assistant Professor, Radiation Oncology

David Raben
David Raben, MD
Assistant Professor, Radiation Oncology

Kendall Winston
Kendall Winston, MD
Professor, Neuro Surgery

Nicholas Foreman
Nicholas Foreman, MD
Associate Professor, Pediatric Oncology

Peggy Hamilton
Peggy Hamilton, RN
Nurse, Radiation Oncology

L. Michael Glode
L. Michael Glode, MD
Professor, Medical Oncology

E. David Crawford
E. David Crawford, MD
Professor, Radiation Oncology

Paul Bunn
Paul Bunn, MD
Professor, Chief, Cancer Center

Christina Finlayson
Christina Finlayson, MD
Assistant Professor, Surgical Oncology

Betty Andros
Betty Andros, RN
Nurse, Radiation Oncology

Appendix H

Letter from Rocky Mountain PBS

The resolution of this matter will affect your community and industry.

In July of 1999, Jefferson County Commissioners denied the application of the Lake Cedar Group to rezone the current Lookout Mountain broadcast site. Lake Cedar proposed the construction of a new consolidated multi-user tower that would remove four of the current towers and reduce Radio Frequency emissions on the mountain. The proposal was consistent with the 1987 Jefferson County Telecommunications plan that called for the reduction of both hardware and emissions for any new development.

Significant pressure against the proposal was brought to bear by a group called the Canyon Area Residents for the Environment (CARE). Fears raised by CARE were primarily based upon misinformation and "fringe science", contradicting the predominant body of research that indicated that the new proposed tower posed no health risks to residents in the area.

The Lake Cedar Group (representing Rocky Mountain PBS and other commercial broadcasters) has filed a petition for expedited special relief and declaratory ruling, requesting that the FCC issue an order preempting the decision by Jefferson County. While some may consider this an extreme measure, it is the only course of action remaining if the Metropolitan Denver Area is to continue to receive free, over-the-air television in the manner in which it is accustomed.

Alternative sites have been investigated and run afoul of Federal Communications Commission policy, Federal Aviation Administration Policy, Jefferson County zoning policy or the interests of homeowners in other areas. The best and most viable site for the transmission of television signals is the one that Denver has used for the past 50 years; Lookout Mountain. This is, what amounts to, the Stapleton/DIA issue all over again.

IF THIS PETITION IS DENIED, HERE IS WHAT IT MEANS TO YOU:

- Free, over-the-air television is in jeopardy. Citizens without the ability to pay for cable TV, satellite TV or other sources of television would be denied service. Public safety, public information and other issues of citizenship would be affected by the loss of free, over-the-air television.
- The Federally mandated conversion to digital television would be stalled in Denver. When the FCC takes away Channel 6 from KRMA in 2008, there would no longer be a KRMA serving the entire Denver Metropolitan Area.
- The educational services of Rocky Mountain PBS would be significantly curtailed by the reduced coverage area. Teachers and students of all ages would no longer have the educational support that Rocky Mountain PBS provides.
- With a reduced service area, KRMA would suffer from reduced public financial support. Fewer viewers mean fewer donors. Boulder, El Paso and Larimer Counties will lose coverage.

On April 10, 2000, the FCC issued a Public Notice inviting interested parties to file by May 10, 2000 statements supporting the Petition. Comments may be filed in letter form to: Office of the Secretary, Federal Communications Commission, 445 Twelfth Street SW, Washington, DC 20554, referencing FCC Reference DA 00-764.

For further information, please contact Victoria Evangelista, Rocky Mountain PBS, 303-892-8666.

Appendix I

Affidavit of Ted Votaw

In the matter of the Lake Cedar Group LLC Proposal
to Rezone and Build a New Tower

Case # 98015154RZPI

Mr. Tim Carl
Jefferson County Planning Dept.
100 Jefferson County Parkway
Golden, Co. 80419

AFFIDAVIT OF TED VOTAW

I, Ted Votaw, the affiant, having first been duly sworn, upon my oath, state I have personal knowledge of the following:

1. I was born July 28, 1949. I am 49 years old.
2. My primary address is 425 London Ave, Lafayette, Colorado 80026
3. I have owned the cabin at 21219 Cedar Lake Road for the last 4 years and purchased it from my uncle, Herbert Votaw so that it could be kept in the family.
4. Before I purchased this cabin and ½ acre of land, my uncle, Herbert Votaw, owned the property for over 50 years.
5. This cabin at 21219 Cedar Lake Road was first built in the late 1920's.
6. In the mid-1940's my uncle, Herbert Votaw, bought the cabin and expanded it.
7. My family and I have been coming to this cabin all my life.
8. There were no towers on Lookout Mountain when my uncle first started coming up to this cabin.
9. When I first started coming to this cabin, the public road came to the house and was east of the Channel 4 tower.
10. In the mid-50's, the Channel 4 tower fell over.
11. Shortly after the Channel 4 tower fell over on March 10, 1955, I observed the tower lying across the road that led to the cabin.

12. Channel 4 permanently closed part of the public road that led to the cabin after the tower blew over.

13. After Channel 4 closed the road that led to our cabin, we could only gain access to the cabin by using a key to go through the Channel 4 gate by Cedar Lake Road

14. Friends and relatives occupy this cabin about 25 occasions a year, some being weekends.

15. Several weeks ago, a Mr. Jim MacDermitt, from Lake Cedar Group, called to ask if I would sell this cabin to his group.

16. When I told Mr. MacDermitt that I did not want to sell, he told me that they would have the property condemned and acquire it that way.

17. I have no intention of selling this cabin to Lake Cedar Group.

18. This cabin is located near the Channel 4 tower.

19. The last time the Channel 4 tower was painted, paint fell on my cabin.

20. Broken lights bulbs from the Channel 4 tower have also fallen on my cabin.

FURTHER THE AFFIANT SAYETH NOT. This 24 day of May, 1999.


Ted Votaw

SUBSCRIBED AND SWORN to before me this 24 day of May, 1999.


Notary Public

My commission expires: 12/14/02